An Interdisciplinary Master's of Science Specialization in Stem Cell Research

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Public Summary:
With funding from the California Institute of Regenerative Medicine Bridges to Stem Cell Research Award 1, we have developed a unique interdisciplinary MS degree specialization in Stem Cell Research. This paper describes the structure of this new program. The interdisciplinary nature of our program stems from the involvement of faculty and students from three departments that span three academic units at our university - Biomedical Engineering, Biological Sciences, and Animal Science. The goals of our program are to prepare students for careers in stem cell research by providing them with 1) broad technical skills, 2) critical thinking and problem solving skills, 3) familiarity with current research, 4) familiarity with the ethics and theory of stem cell investigation, and 5) presentation and communication skills. To accomplish these goals, students from the three departments progress through three components - one year of coursework, a nine-month research internship, and a Master's project. For their coursework, students complete five common-core courses - Principles of Tissue Engineering, Cell Transplantation and Biotherapeutics, Introduction to Biomedical Imaging, Stem Cell Research Seminar, and Principles of Stem Cell Biology. Through the laboratory coursework, students gain experience with cell culture, scaffold development, cell sodding, histochemical staining, animal surgery, therapeutic delivery, animal experimentation, fluorescent and laser microscopy, and cell staining. In addition to the core courses, students also complete classes specific to their discipline, i.e. Biomedical Engineering, Biological Sciences, or Animal Science. After completing their coursework, students complete a nine-month internship in a stem cell research lab at one of our partner institutions. The nine-month internship, which addresses all of our programmatic learning goals, allows students to further develop their laboratory and critical thinking skills in a research-intensive environment with a rigorous and independent project. Upon completion of their research internships, students return for one final quarter of coursework. During the quarter, students complete a Master's Project Course that allows them to apply the skills gained during the research internship to existing research efforts at our university. This Master's Project provides students with the opportunity to demonstrate transfer of knowledge and skills gained during the completion of their degree and therefore represents the culmination of their training MS degree training in stem cell research.

Scientific Abstract: